Customer No. 20350
TOWNSEND and TOWNSEND and CREW LLP
Two Embarcadero Center, 8th Floor
San Francisco, California 94111-3834
(415) 576-0200

Attorney Docket No. _____ 20510-4.00US_____

"Express Mail" Label No. ____ EL630584823US ____

Date of Deposit: _____ August 31, 2000 _____

ASSISTANT COMMISSIONER FOR PATENTS
BOX PATENT APPLICATION
Washington, D.C. 20231

Sir:
Transmitted herewith for filing under 37 CFR 1.53(b) is the
    [X] patent application of
    [ ] continuation patent application of
    [ ] divisional patent application of
    [ ] continuation-in-part patent application of

Inventor(s)/Applicant Identifier: GUDMUNDUR "JIM" HJARTARSON et al.

For: ENHANCED LINE CARD AND PACKETIZING CPE FOR LIFELINE PACKET VOICE TELEPHONE

[X]   This application claims priority from each of the following Application Nos./filing dates:
    __Canadian Application No. 2,281,356 Filed September 1, 1999_____,
    the disclosure(s) of which is (are) incorporated by reference.
[ ]   Please amend this application by adding the following before the first sentence: "This application is a [ ] continuation [ ] continuation-in-part of and claims the benefit of U.S. Provisional Application No. 60/_____, filed _____, the disclosure of which is incorporated by reference."

Enclosed are:
[X]   __10__ page(s) of specification
[X]   __3__ page(s) of claims
[X]   __1__ page of Abstract
[X]   __3__ sheet(s) of informal drawing(s).
[ ]   An assignment of the invention to _____
[X]   A unsigned Declaration & Power of Attorney
[ ]   A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27 [ ] is enclosed [ ] was filed in the prior application and small entity status is still proper and desired.
[ ]   Information Disclosure Statement under 37 CFR 1.97.
[ ]   A petition to extend time to respond in the parent application.
[ ]   Notification of change of [ ] power of attorney [ ] correspondence address filed in prior application.
[ ]

**In view of the Unsigned Declaration as filed with this application and pursuant to 37 CFR §1.53(f),
Applicant requests deferral of the filing fee until submission of the Missing Parts of Application.**

DO **NOT** CHARGE THE FILING FEE AT THIS TIME.

Kenneth R. Allen
_____
Kenneth R. Allen
Reg No.: 27,301
Attorneys for Applicant

Telephone: Facsimile:
(650) 326-2400   (650) 326-2422

PA 3093721 v1

PATENT APPLICATION

ENHANCED LINE CARD AND PACKETIZING CPE FOR LIFELINE PACKET VOICE TELEPHONE

Inventors:

Gudmundur "Jim" Hjartarson, a citizen of Canada, residing at,
39 Marble Arch Crescent
Nepean, Ontario,   K2G 5S7
Canada

Jonathan Boocock, a citizen of Canada, residing at,
742 Bayview Drive, R.R. #1
Woodlawn, Ontario,   K0A 3M0
Canada

Andrew Deczky, a citizen of Canada, residing at,
732 Highland Avenue
Ottawa, Ontario,   K0A 2K7
Canada

Andreas Weirich, a citizen of Canada, residing at,
15 Basford Crescent
Stittsville, Ontario,   K2S 1G7
Canada

Mark Feeley, a citizen of Canada, residing at,
26 Marchbrook Circle
Kanata, Ontario,   K2K 2A1
Canada

Assignee:

Catena Networks, Inc.
303 Twin Dolphin Drive, Suite 600
Redwood Shores, CA 94065
a California corporation

Entity: Small business concern

ENHANCED LINE CARD AND PACKETIZING CPE FOR LIFELINE PACKET VOICE TELEPHONE

CROSS-REFERENCES TO RELATED APPLICATIONS

5   This application claims priority from Canadian Patent Application Serial Number 2, 281,356, filed September 1, 1999.

BACKGROUND OF THE INVENTION

        The present invention relates generally to the field of Digital Subscriber

10   Line (DSL) systems, and particularly to packetized voice access systems.

        Conventionally, telephone service is provided by the Public Switched Telephone Network (PSTN), which consists of a multiplicity of telephone switches interconnected by various transport media and formats (the PSTN transport network), and connected to telephone terminals at subscriber's premises by twisted pair loop wires.

15   Figure 1 illustrates a conventional circuit switched telephone network, represented generally by the numeral 10. In this example, the PSTN transport network 12 interconnects telephone switches 14. The switches, in turn, interface by means of POTS line cards 16 to individual twisted pair loops 18 and telephone terminals 20. In the case of typical residential telephone service, the POTS line card 16 provides a number of

20   functions required to operate a telephone terminal 20 connected at the subscriber's residence. These functions are often collectively referred to as BORSCHT and usually include, but are not limited to:

        Battery - supplying power;

        Overvoltage - protecting the line card against environmentally caused

25   overvoltages;

        Ringing - supplying a signal which energizes the telephone terminal receiver;

        Supervision - detecting whether a subscriber telephone receiver is on hook or off hook;

30   Coding - converting the analog loop signal into digital representation;

        Hybrid - separating the received from the transmitted signals; and

        Termination - terminating the loop with a required standard electrical impedance at the line card.

Although implementation details differ, the B, O, R, S, and T functions typically reside in the Analog Front End 22 and the C, H, and T functions in the Voice Engine 24. The line card 16 supplies power to the telephone terminal 20 from an uninterruptible power supply 26. The power supply 26 is physically situated in the

5 telephone central office and is referred to as the Central Office (CO) Battery. The CO Battery plant is engineered and sized to supply power to conventional telephone terminals 20 even in the event of a general power outage. Therefore, telephone service is characterized by a high degree of availability, a grade of service referred to as "lifeline" POTS. Typically, a line card 16 is capable of supplying up to 30 mA of current at 48 V to

10 a twisted pair loop 18 and telephone 20. However, the exact value of current depends on the combined electrical resistance of the twisted pair loop 18 and the telephone terminal 20. The exact current limit value is implementation dependent and may range from 20 to 35 mA.

With the explosive growth in data communications, a Multi Service Data

15 Network (MSDN) has evolved which now has more aggregate bandwidth and is growing more rapidly than the PSTN transport network. Data communications networks are developing that more easily support protocols and network elements which enable the routing and switching of self-contained collections of bits known as packets or cells. Essentially, each packet/cell can be independently routed or switched by devices known

20 as routers to different destinations based on a destination address contained within each packet or cell. This is known as packet switched networking. If a packet stream contains digital representations of a voice conversation, routing of these packets represents a function analogous to conventional circuit switched telephony switching. It should be noted that the term voice is used generically and its definition may be extended to include

25 other analog transmissions such as fax, conventional modems, and the like. In the following descriptions, packets and cells are understood to be analogous entities and, unless specifically indicated, may be used interchangeably and individually without restricting the generality of the description. The terms VoIP (Voice over IP) and VoATM (Voice over ATM) are to be treated in a similar fashion.

30 Figure 2 represents a network configuration for interconnection of a MSDN to a conventional telephone by means of voice packetization technology, namely, a Packet Switched Voice Access Network 30. The Multi Service Data Network 32 interconnects and routes packets/cells among various Digital Subscriber Loop Access Multiplexers (DSLAMs) 34, which multiplex data streams from multiple DSL Line Cards

36. Each DSL line card 36 interfaces to and communicates over a twisted pair loop 18 to DSL Customer Premises Equipment (CPE). The DSL CPE may be self contained and connected to a source of packet/cell data such as a computer (not shown), may be a DSL Network Interface Card (DSL NIC) (not shown) internal to a computer, or may be a CPE herein called a Voice Packetizing CPE 38. The DSL line card 36 may communicate using any of a number of methods that impress a signal representing a digital bit stream onto twisted pair loops 18 more conventionally used to carry POTS signals. These methods include, but are not limited to, the methods or services generally known as ADSL (Asymmetric DSL), SDSL (Symmetric DSL), HDSL (High-rate DSL), VDSL (Very high-rate DSL), ISDN (Integrated Services Digital Network), MVL (Multiple Virtual Lines), or CAP (Carrierless Amplitude/Phase).

The Voice Packetizing CPE 38 transforms the analog signals from a conventional telephone terminal 20 into voice packets or cells suitable to be carried in a DSL signal on the twisted pair loop 18 from the subscriber's premises. In order to operate a conventional telephone terminal 20, the Voice Packetizing CPE 38 includes most of the functions associated with a conventional telephone switch POTS line card 16 in its Voice Engine 42 and Analog Front End 44. Some specific differences from the corresponding POTS line card blocks might include coding to a 16 bit linear digital representation rather than μ-law or A-law, the provision of 24 V rather than 48 V powering of the telephone terminal, reduced robustness to line overvoltages, and the like. The differences do not impact on the nature or significance of functions described below. A Voice over Internet Protocol (VoIP) or Voice over Asynchronous Transfer Mode (VoATM) Engine 46 may include circuits and algorithms for reducing the bit rate of the digitized voice stream received from the Voice Engine 42. The VoIP /VoATM Engine 46 also processes the reduced bit rate stream into packets or cells and may also include an echo cancellation capability for reducing the subjective audible effects of the delay introduced by the coding and packetizing operations. These functions typically implement a set of protocols which may include an embodiment of ITU Recommendation H.323, G.168 or similar standards and algorithms. The packet/cell stream generated by the VoIP/VoATM Engine 46 is transmitted to and received from the DSLAM 34 by means of the DSL modem 40. The DSL modem 40 may implement any of a variety of digital subscriber loop standards, such as ITU Recommendation G.992.1 ("Full rate ADSL") or G.992.2 ("ADSL lite").

3

Because the circuits contained within the Voice Packetizing CPE 38 require more power than can typically be provided by a Line Card 36, they are typically powered by means of a power supply 48 which derives its power from the local AC mains. If a local power outage disrupts AC mains power, communication using the Voice

5   Packetizing CPE is not possible until AC mains power is restored. This is problematic for subscribers accustomed to telephone service being available despite power outages, and especially in case of a life or security threatening emergency situation. Uninterruptible AC power supplies (UPS) are commercially available which will provide AC power for a short time in the event of a local AC mains power outage. However, the disadvantages of

10   local UPSs are the purchase cost, the limited time these devices can supply power, and the regular maintenance that is required to ensure they are operational in the event of a power outage.

Further, in conventional packet based networks, provision of lifeline packet voice service requires up to 3 separate pieces of equipment: a DSLAM, POTS

15   Access Equipment such as a Digital Loop Concentrator, and a Gateway. The Gateway is an item of network equipment that provides a translation and mediation of voice and signaling signals and protocols between the PSTN and the MSDN. The need for three separate pieces of equipment increases overall network and equipment complexity and complicates service provisioning and maintenance.

20   What is needed is a mechanism to obviate or mitigate at least some of the above disadvantages.

SUMMARY OF THE INVENTION

According to the invention, a voice and data communication system is

25   provided whereby a line card digitizes and packetizes voice communications signals even upon the failure of Customer Premises Equipment (CPE). The system comprises a line card for coupling the CPE with a network which line card includes:

an analog front end for coupling the line card to the CPE;

a digitizer for digitizing the received voice signals;

30   a packetizer for packetizing the digitized voice signals;

a modem for transmitting the packets; and

a system interface for coupling the line card to at least one network.

4

Furthermore, the invention provides a system that can direct the voice signals to either or both of a voice network (e.g. the PSTN) and a data network (e.g. the MSDN). The system comprises a line card including:

an analog front end for coupling the line card to a telephone;

a digitizer for digitizing the received voice signals;

a packetizer for packetizing the digitized voice signals;

a modem for transmitting the digitized voice signals to the data network;

a system interface for coupling the line card to the voice network and the data network; and

a controller for controlling the destination of the voice signal.

The invention will be better understood by reference to the following description of specific embodiment and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of a conventional circuit switched telephone network interface.

Figure 2 is a block diagram of a conventional packetized voice access system.

Figure 3 is a block diagram of a lifeline packetized voice access system according to the invention.

DESCRIPTION OF SPECIFIC EMBODIMENTS

For convenience, like structures in the drawing are referred to using like numerals.

Figure 3 illustrates a Lifeline Packetized Voice Access system according to the invention which is represented generally by the numeral 60. The system 60 enables a lifeline grade of service to be offered for packetized voice telephony using either a Lifeline Packetizing Voice (LPV) CPE 62, as described below, or a conventional analog telephone terminal 20.

The LPV CPE 62 contains functional blocks comprising a conventional voice packetizing CPE 38 as previously described and illustrated in Figure 2. Specifically, it comprises a DSL modem 40, VoIP or VoATM Engine 46, Voice Engine 42, and an Analog Front End 44, as well as the Power Supply 48. Additionally, the LPV CPE contains an optional POTS splitter 78, enabling a telephone terminal 20 to be connected to the twisted pair 18 through a relay 80. The common contacts of the relay 80

are connected to the telephone terminal 20, and the normally closed contacts are connected to the POTS Splitter 78. The relay is energized by a DSL Synch Detect signal 76 from the DSL modem within the voice packetizing CPE 40.

Under normal conditions, that is when the AC mains power to the Lifeline Packetizing CPE is present and the DSL modem is synchronized to a valid DSL signal on the twisted pair loop, the DSL Synch Detect signal is asserted and energizes the relay 80. When the relay 80 is energized, the common contacts are connected to the relay's normally open contacts. Therefore, the telephone terminal 20 is connected to the voice packetizing CPE 38, causing voice communications to occur by means of a digital packet/cell stream over a DSL signal through the DSL Modem 35 of the LPV Line Card 66, and to the MSDN 32.

If, however, local power to the Lifeline Packetizing CPE 62 should fail, or the DSL Modem 40 component of the voice packetizing CPE 38 does not detect a valid DSL signal, the DSL Synch Detect signal 75 is negated and de-energizes the relay 80. Therefore, the telephone terminal 20 connects through the normally closed contacts of the relay 80 and the POTS Splitter 78 to the twisted pair loop 18. In this state, the telephone terminal is directly connected to the twisted pair (through the POTS splitter 78) and powered from the CO battery through a Broadband Analog Front End (BAFE) 72 on a Lifeline Packet Voice Line Card (LPVLC) 68. Voice communication takes place through a Voice Engine 24 and a VoIP/VoATM Engine 46 on the line card 68, in a packetizing voice line card fashion.

A number of Lifeline Packet Voice Line Cards (LPVLC) 66 are contained within appropriate access equipment 68. The equipment 68 could be a Digital Loop Carrier system, a voice-capable DSLAM, a data-capable digital telephony switch, or the like.

The Lifeline Packet Voice Line Card 66 contains circuitry for interfacing to both an analog telephone terminal and a DSL-based CPE. A system interface 70 contains circuitry to interface both to the Public Switched Telephone Network (PSTN) 12 and the Multi Service Data Network (MSDN) 32. The interfaces described here are conceptually identical to their respective interfaces shown in Figure 1 and Figure 2. The Voice Engine 24 and DSL Modem 35 may of the type illustrated in the respective blocks in Figure 1 and Figure 2. The Broadband Analog Front End 72 combines the functionality of the voice only Analog Front End 22 of the POTS Line Card in Figure 1 and the DSL Front End 37 of the DSL Line Card in Figure 2. The Broadband Front End

6

72 provides the B, O, R, S, and T functions over the full bandwidth required to support both voice and DSL signals, and it satisfies the distinct requirements of both DSL and POTS interface types with regard to termination impedance, drive levels, linearity, and loop powering.

5   The VoIP or VoATM Engine 46 performs the function of the type previously described and depicted in the Voice Packetizing CPE 38 of Figure 2. The Engine 46 takes the digitized voice from the voice engine 24, performs compression, packetization, and, optionally, echo cancellation. The resulting voice packets are sent to the system interface 70, where they may be merged with the packet/cell stream from the

10   DSL modem block 35. This merging function may be implemented in the LPVLC or elsewhere in the Access Equipment 68. The merging is controlled by the merge controller 74, which produces a merge signal. The merge signal 75 is sent to the Voice Engine 24, the VoIP Engine 46, and the System Interface 70 blocks. The merge controller 74 may be configured to operate in several modes described as follows. If the merge

15   control signal 75 is continuously asserted, the system is in Packetizing Voice mode, and the line card 66 will packetize the voice signals and direct the resulting packet stream to the MSDN, while powering a conventional telephone terminal 20. If the merge control signal 75 is continuously negated, the system is in POTS only or Packetizing CPE only mode and the line card 66 will not packetize the voice signals. However, the merge

20   control signal 75 may also be responsive to a DSL Synch Detect signal 76 produced by the DSL Modem 35 whenever a valid DSL signal originating from the subscriber CPE is detected. This mode is referred to as Lifeline Packetizing CPE mode. According to the invention, when the CPE is not fully functional , perhaps due to a mains power outage, the line card packetizes the voice signals and directs the resulting packet stream to the

25   MSDN, while powering a conventional telephone terminal.

The Lifeline Packet Voice Line Card 66 of the invention is therefore capable of performing the function of a conventional POTS line card as shown in Figure 1, or of a DSL line card as shown in Figure 2. When operating as a DSL line card 36, the Lifeline Packet Voice Line Card 66 may be part of a conventionally defined VoIP or

30   VoATM system, where the voice packetization is performed at the CPE. The access equipment 68 in such a system does not process or alter the content of the packets or cells in the VoIP or VoATM stream but merely provides an appropriate transport for the VoIP or VoATM stream from the subscriber to the MSDN 32.

7

The Lifeline Packet Voice Line Card 66 is also capable of operating as a packetizing voice line card. In this mode, the LPV Line Card 66 provides an interface for a conventional telephone terminal 20, through the BAFE 72 and the Voice Engine 24. Therefore, if the power has failed at a subscriber premises, the telephone terminal is

5   powered conventionally through the BAFE 72 from the Central Office (CO) battery (not shown) and can still transmit a voice signal to the line card 66. The Voice Engine 24 on the line card 66 digitizes the voice signal which is then packetized by the VoIP/VoATM Engine 46. The resulting packet/cell stream is delivered through the system interface 70 to the MSDN 32. Since the telephone terminal is powered from the CO, and the voice

10   signal is delivered as a packet/cell stream to the MSDN 32, the net result is a packet voice communications capability with a lifeline grade of service.

To this point, the system has only been described as if powering and communicating with a telephone terminal and voice packetization are necessarily a function mutually exclusive with DSL communication. However, the system definition

15   may also be extended to provide DSL communication on the same loop and simultaneous with a POTS interface. Simultaneous DSL and POTS capability on a single loop is defined in the ITU Recommendations for ADSL, for example, but is not necessarily possible for any other type of DSL modem or modulation scheme.

Referring once again to Figure 3, a telephone terminal 20 and DSL modem

20   82 both communicate on the same loop 18 to the access equipment 68 through a POTS splitter 84. In some circumstances the splitter 84 may be optional. Typically, data from the DSL CPE 82 and voice signals from the telephone 20 would communicate on the same loop 18. The signals are filtered by the BAFE 72 after which the voice signal is directed via the Voice Engine 24 and system interface 70 to the PSTN 12. The data

25   signal is directed to and demodulated by the DSL modem 35 and the resulting data packet/cell stream is directed via the system interface 70 to the MSDN 32. Both voice and data processing are, therefore, simultaneously possible on a single line card.

Alternatively, once the Voice Engine 24 has digitized the voice signal, the VoIP/VoATM Engine 46 may be used to packetize the digitized voice signal and the

30   system interface 70 may merge the voice packets with the data packets from the DSL modem 35. The merged packet stream would be sent over the MSDN. In order to provide simultaneous Lifeline Packet Voice and data communications capability over the DSL to the MSDN, the system interface 70 includes a packet or cell multiplexing capability. The multiplexer enables the merging of the voice packet or cell stream from

the VoIP/VoATM Engine 46 with the packet or cell stream from the DSL Modem 35. As previously mentioned, the merging function may be implemented in the LPVLC or elsewhere in the Access Equipment 68. The multiplexer also enables the diverging of the voice packet or cell stream from the MSDN so that the appropriate streams are sent to the VoIP/VoATM Engine 46 and DSL Modem 35 respectively.

Therefore it can be seen that the Lifeline Packet Voice Line Card 66 has the capability to direct the output of the Voice Engine 24 to either the PSTN 12 or, via the VoIP/VoATM Engine 46, to the MSDN 32, or simultaneously to both. The decision as to where to direct the voice packet stream can be made on a call-to-call basis. The capability to redirect the call exists at any time and for numerous reasons, for example during a power failure or a network connectivity failure. The line card 66, therefore, has the capability to rapidly alter the path a voice connection takes through either the PSTN or the MSDN.

As a result of the architecture used, the system may be able to provide higher quality audio encoding, referred to as Enhanced Packet Voice. In conventional system architectures, it is not always possible to provide Enhanced Packet Voice due to the difficulty in providing increased transport bandwidth between the voice coder and packetizer, which may be in physically distinct and geographically dispersed equipment. Since the architecture in this embodiment of the invention utilizes a voice coder 24 and a packetizer 46 on the same card, Enhanced Packet Voice may be implemented.

Enhanced Packet voice is achieved by providing an alternate, higher quality coding function in the Voice Engine 24 and in the VoIP/VoATM Engine 46, optionally coupled with a capability to code audio frequencies outside the conventional 300 to 3,400 Hz bandwidth of toll quality voice. Alternatively, it may also be implemented in the corresponding components at the CPE 62.

Enhanced Packet Voice is useful in applications such as audio conferencing and echo cancellation, where the non-linearity of conventional µ-law or A-law code results in a reduced effectiveness of those algorithms processing the coded voice or voice band signal. Examples of alternate coders for the Voice Engine are 16-bit linear coders, coders with a higher than usual sampling rate, and coders that are both 16-bit linear coders and have a higher sampling rate. The reduction of effectiveness is typically, although not exclusively, due to nonlinear coding yielding a reduced quality of coding of a desired signal when a stronger, undesired signal is present.

9

Examples of alternate coders for the VoIP/VoATM Engine include perceptual coders defined for studio or CD quality audio. An alternate, higher quality coder generally results in a higher packet/cell rate from the VoIP/VoATM Engine.

Although the invention has been described with reference to certain specific embodiments, various modifications thereof will be apparent to those skilled in the art without departing from the spirit and scope of the invention as outlined in the claims appended hereto.

WHAT IS CLAIMED IS:

1   1.   A voice and data communication system comprising a customer

2   premises equipment (CPE) element and a line card for transferring communication

3   signals between a subscriber and a network, said line card comprising:

4   an analog front end for coupling said line card to said CPE through a

5   transmission medium;

6   a digitizer for digitizing received voice signals;

7   a packetizer for packetizing said digitized voice signals;

8   a modem for transmitting voice and data packets to said CPE; and

9   a system interface for coupling said line card to at least one network;

10   wherein said line card digitizes and packetizes said voice signals upon

11 failure of said CPE.

1   2.   A system as defined in claim 1, wherein said CPE comprises:

2   a digitizer for digitizing received voice signals;

3   a packetizer for packetizing said digitized voice signals;

4   a modem for transmitting voice packets; and

5   a switch for bypassing said packetizing system to a Plain Old Telephone

6   System (POTS) terminal.

1   3.   A system as defined in claim 2, wherein said switch is a relay for

2   switching between said packetizer and said POTS system.

1   4.   A system as defined in claim 3, wherein the position of said switch

2   is determined by a signal, said signal indicating the status of the connection between said

3   CPE and said line card.

1   5.   A system as defined in claim 1, wherein said modem is a Digital

2   Subscriber Line (DSL) modem.

1   6.   A system as defined in claim 2, wherein said line card packetizes

2 said voice signals upon failure of said CPE to do so, and wherein digitizing and

3 packetizing equipment of said CPE is bypassed.

1   7.   A system as defined in claim 2, wherein said failure is a power

2 failure at said subscriber's location.

1   8.   A system as defined in claim 2, wherein said failure is inability to

2 synchronize a DSL modem on said CPE with a DSL modem on said line card.

1   9.   A system as defined in claim 2, wherein said digitizers provide

2 high quality audio encoding.

1   10.   A system as defined in claim 2, wherein said packetizers provide

2 high quality audio encoding.

1   11.   A system for providing a voice signal for transmission comprising

2 a line card for receiving said voice signal from a telephone, said line card including:

3   an analog front end for coupling said line card to said telephone;

4   a digitizer for digitizing received voice signals;

5   a packetizer for packetizing said digitized voice signals;

6   a modem for receiving voice packets from a CPE and transmitting said

7 voice packets to a data network;

8   a system interface for coupling said line card to a voice network and said

9 data network; and

10   a controller for controlling the destination of said voice signal;

11   wherein said system can provide said voice signals to said voice network

12 and said data network.

1   12.   A system as defined in claim 11, wherein said line card is operative

2 to receive a data signal on the same loop as said voice signal, said analog front end

3   separates said data signal from said voice signal, and said modem transmits said data

4   signal to said data network.

1   13.   A system as defined in claim 11, wherein said modem is a DSL

2   modem.

ENHANCED LINE CARD AND PACKETIZING CPE FOR LIFELINE PACKET VOICE TELEPHONE

ABSTRACT OF THE DISCLOSURE

A voice and data communication system whereby a line card digitizes and

5   packetizes voice communications signals upon the failure of Customer Premises Equipment (CPE). The system comprises a line card for coupling the CPE with a network. Furthermore, the invention provides a system that can direct the voice signals to either or both of a voice network and a data network.
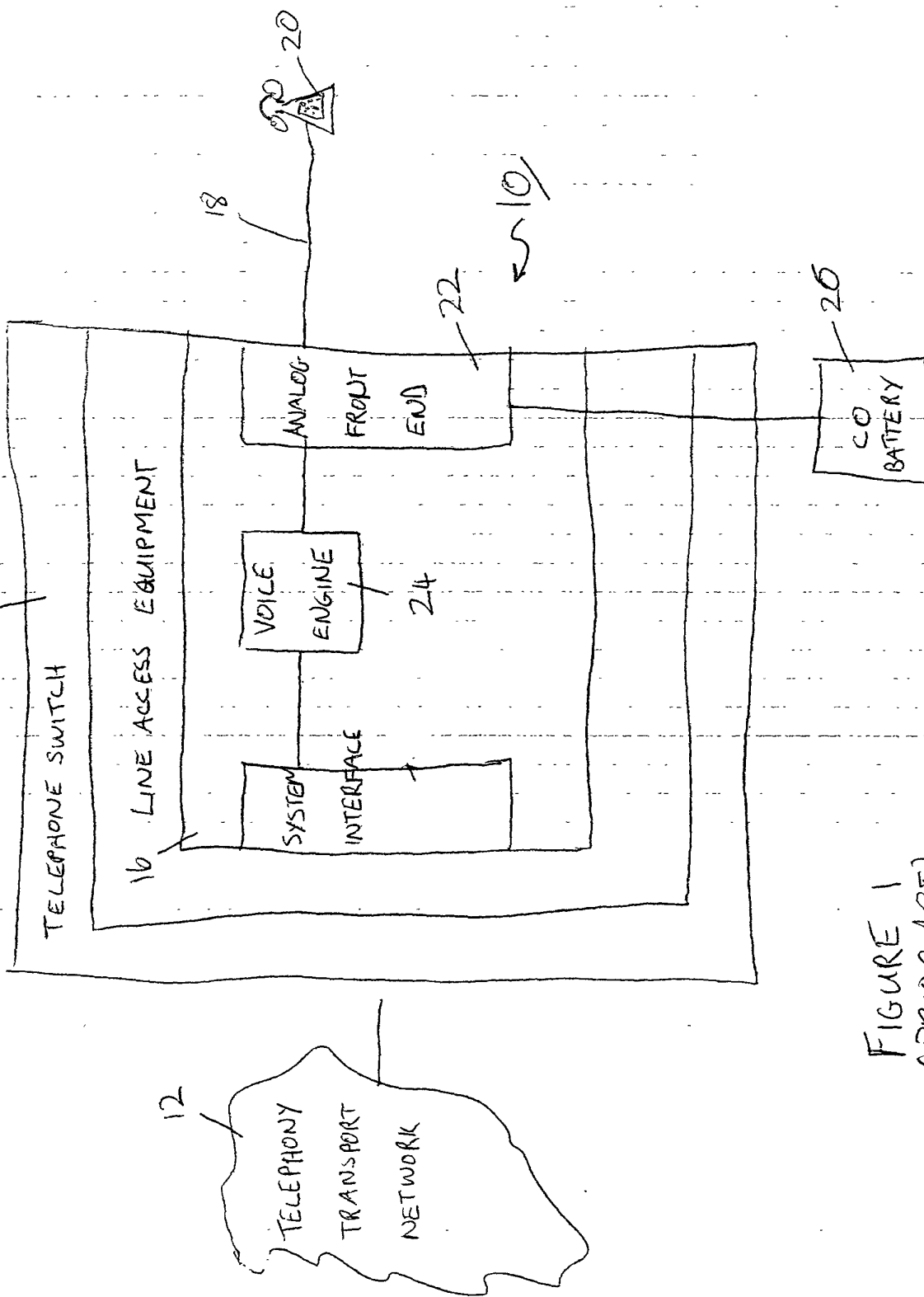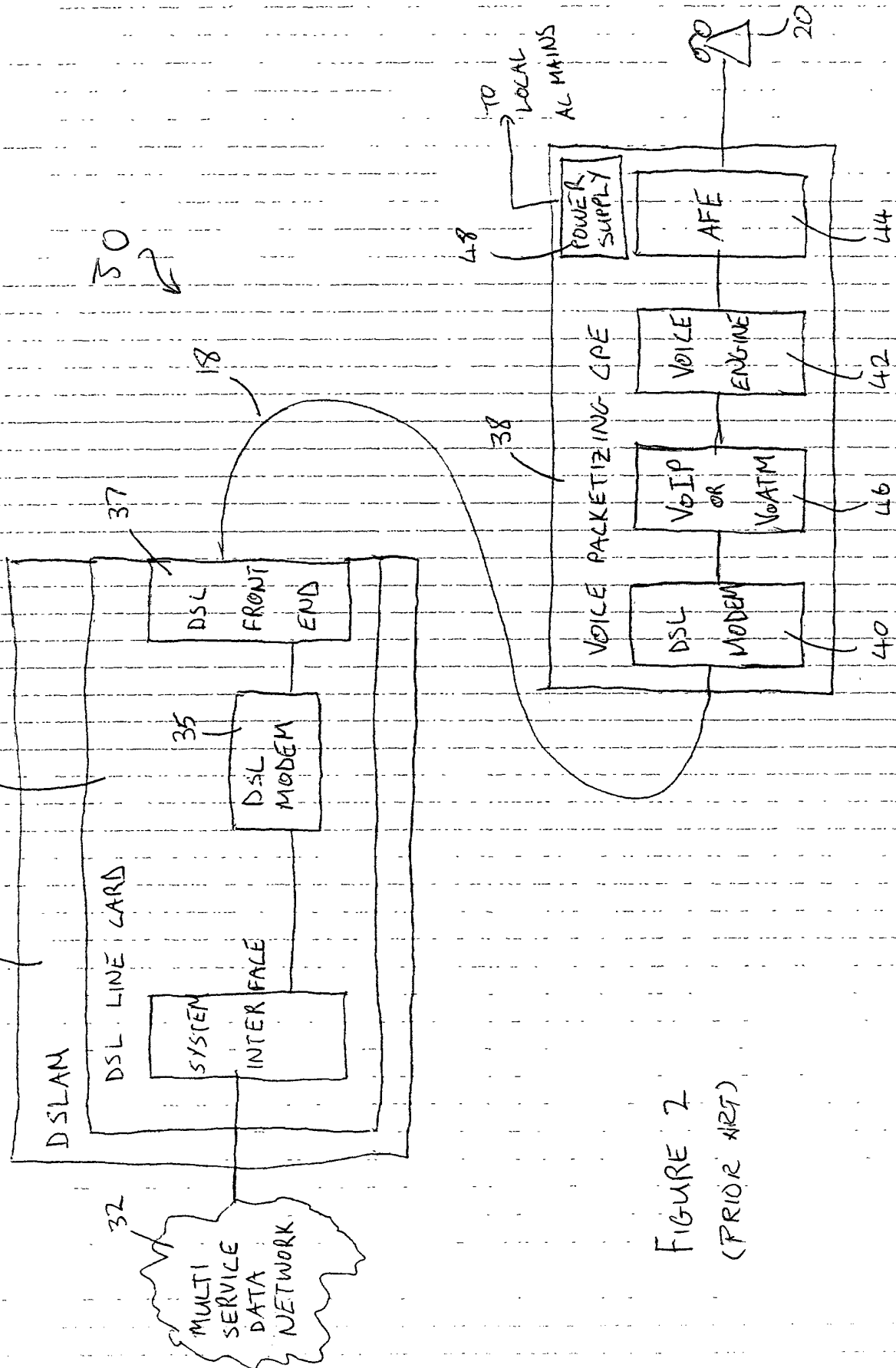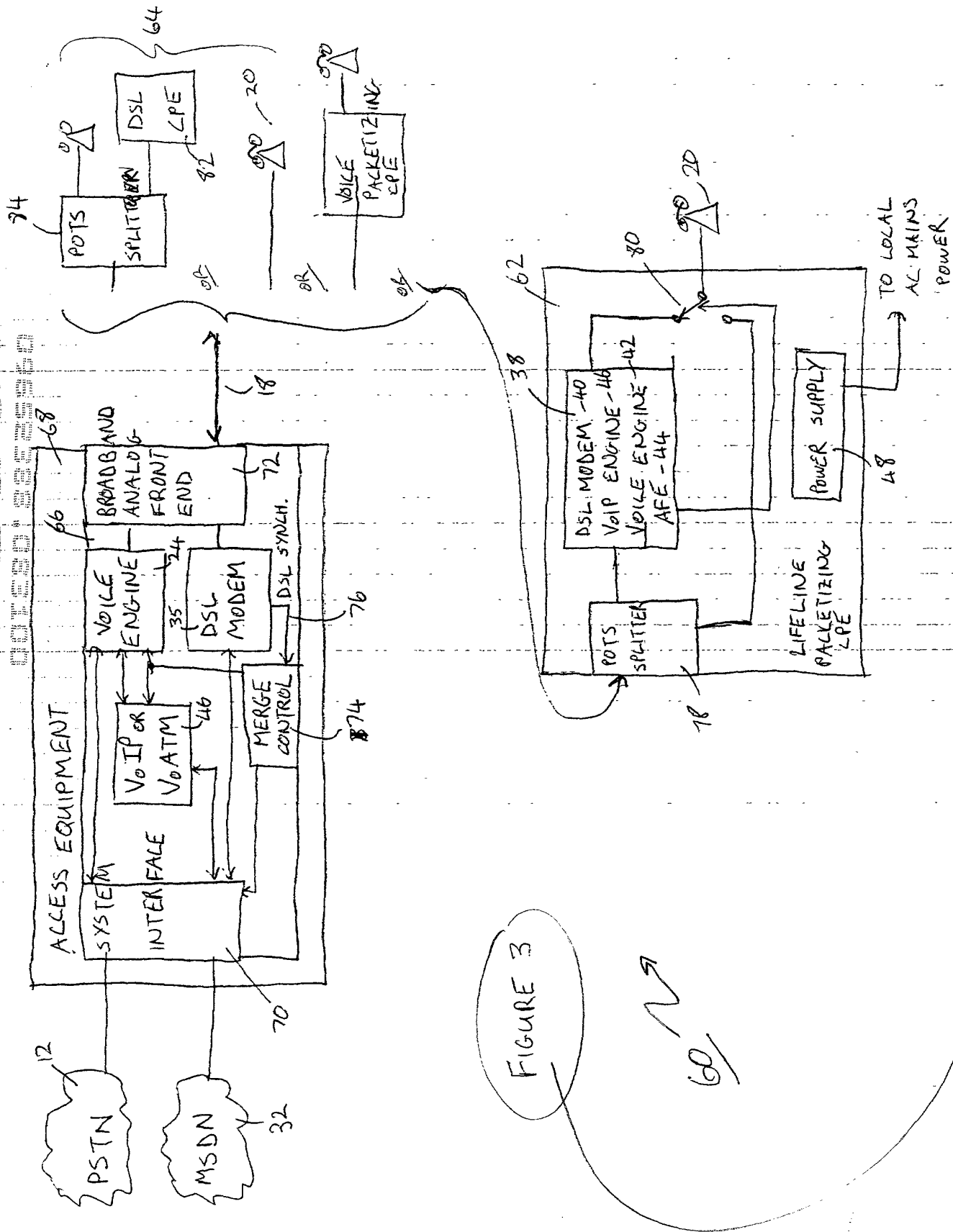
10   PA 3093799 v1 KRA

FIGURE 1
(PRIOR ART)

TELEPHONE SWITCH 14

LINE ACCESS EQUIPMENT 16

SYSTEM INTERFACE

VOICE ENGINE 24

ANALOG FRONT END 22

18

20

10

CO BATTERY 26

TELEPHONY TRANSPORT NETWORK 12

FIGURE 2
(PRIOR ART)

FIGURE 3

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I declare that:

My residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **ENHANCED LINE CARD AND PACKETIZING CPE FOR LIFELINE PACKET VOICE TELEPHONE** the specification of which is attached hereto.

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56. I claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Country	Application No.	Date of Filing	Priority Claimed Under 35 USC 119
Canada	2,281,356	September 1, 1999	Yes

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Kenneth R. Allen, Reg. No. 27,301
David N. Slone, Reg. No. 28,572

Send Correspondence to: **Kenneth R. Allen** **TOWNSEND and TOWNSEND and CREW LLP** **Two Embarcadero Center, 8th Floor** **San Francisco, California 94111-3834**	Direct Telephone Calls to: (Name, Reg. No., Telephone No.) Name: Kenneth R. Allen Reg. No.: 27,301 Telephone: 650-326-2400

Full Name of Inventor 1:	Last Name: **HJARTARSON**	First Name: **GUDMUNDUR "JIM"**	Middle Name or Initial:	
Residence & Citizenship:	City: **Nepean, Ontario**	State/Foreign Country: **Canada**	Country of Citizenship: **Canada**	
Post Office Address:	Post Office Address: **39 Marble Arch Crescent**	City: **Nepean, Ontario**	State/Country: **Canada**	Postal Code: **K2G 5S7**
Full Name of Inventor 2:	Last Name: **BOOCOCK**	First Name: **JONATHAN**	Middle Name or Initial:	
Residence & Citizenship:	City: **Woodlawn, Ontario**	State/Foreign Country: **Canada**	Country of Citizenship: **Canada**	
Post Office Address:	Post Office Address: **742 Bayview Drive, R.R. #1**	City: **Woodlawn, Ontario**	State/Country: **Canada**	Postal Code: **K0A 3M0**
Full Name of Inventor 3:	Last Name: **DECZKY**	First Name: **ANDREW**	Middle Name or Initial:	
Residence & Citizenship:	City: **Ottawa, Ontario**	State/Foreign Country: **Canada**	Country of Citizenship: **Canada**	
Post Office Address:	Post Office Address: **732 Highland Avenue**	City: **Ottawa, Ontario**	State/Country: **Canada**	Postal Code: **K0A 2K7**

Full Name of Inventor 4:	Last Name: **WEIRICH**		First Name: **ANDREAS**	Middle Name or Initial:	
Residence & Citizenship:	City: **Stittsville, Ontario**		State/Foreign Country: **Canada**	Country of Citizenship: **Canada**	
Post Office Address:	Post Office Address: **15 Basford Crescent**		City: **Stittsville, Ontario**	State/Country: **Canada**	Postal Code: **K2S 1G7**
Full Name of Inventor 5:	Last Name: **FEELEY**		First Name: **MARK**	Middle Name or Initial:	
Residence & Citizenship:	City: **Kanata, Ontario**		State/Foreign Country: **Canada**	Country of Citizenship: **Canada**	
Post Office Address:	Post Office Address: **26 Marchbrook Circle**		City: **Kanata, Ontario**	State/Country: **Canada**	Postal Code: **K2K 2A1**

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature of Inventor 1	Signature of Inventor 2	Signature of Inventor 3
Gudmundur "Jim" Hjartarson	Jonathan Boocock	Andrew Deczky
Date	Date	Date
Signature of Inventor 4	Signature of Inventor 5	
Andreas Weirich	Mark Feeley	
Date	Date	

PA 3093832 v1